Enabling Your Mac Applications for Assistive Technology

Session 126

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Enabling Your Mac Applications for Assistive Technology

Eric Seymour
Manager, VoiceOver Engineering

System Preferences Edit View Window Help

Universal Access

Show All

When using this computer, I would like assistance with:

Seeing | Hearing | Keyboard | Mouse & Trackpad

VoiceOver: Turn VoiceOver on or off: ⌘F5

On Off — Open VoiceOver Utility...

Zoom:

On Off

Turn zoom on or off: ⌥⌘8
Zoom in: ⌥⌘=
Zoom out: ⌥⌘-

Options...

Display: Switch to white on black: ^⌥⌘8

Black on white
White on black

Use grayscale

Enhance contrast:

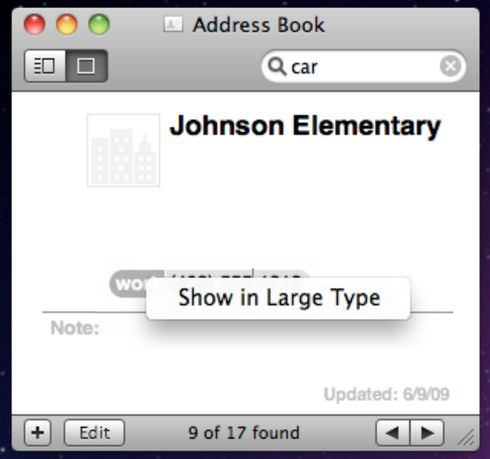
Normal — Maximum

Reduce contrast: ^⌥⌘,
Increase contrast: ^⌥⌘.

Enable access for assistive devices

Show Universal Access status in the menu bar

Address Book File Edit View Card Window Help



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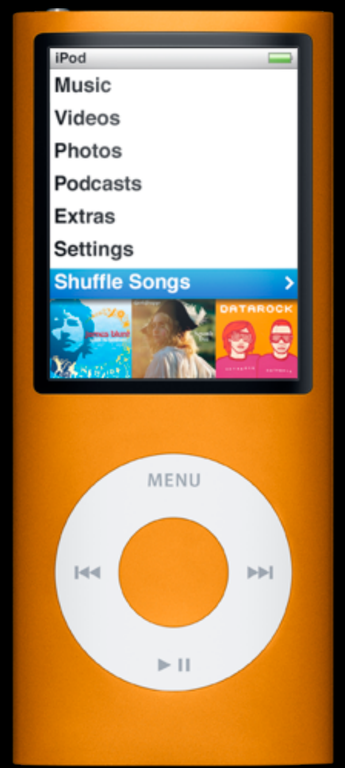
iTunes
OneSixRight captioned
0:55
-3:53
View
Search
Everybody drivin' a big airplane
started in a little airplane.
Everybody drivin' a big airplane
started in a little airplane.
Mike Dewey
Pilot
MENU
Everybody drivin' a big airplane
started in a little airplane.
Mike Dewey
Pilot

Talking iPods



VoiceOver

Plug-and-Play Braille

"…for making significant accessibility improvements to the latest versions of the iPod Nano and the iTunes software, and for installing the VoiceOver screen reading software into all Apple computers."

American Foundation for the Blind

Apple – Mac OS X Snow Leopard – Accessibility

http://www.apple.com/macosx/accessibility/

Google

Store | Mac | iPod + iTunes | iPhone | Downloads | Support | Search

Mac OS X Snow Leopard

Refinements | Technology | Accessibility | What is Mac OS X? | Tech Specs | Notify Me

Mac OS X Snow Leopard. Innovation for everyone.

Every Mac comes standard with a wide range of assistive technologies that help people with disabilities experience what the Mac has to offer. We call this Universal Access, and it includes many features you won't find in other operating systems at any price. In Mac OS X, they're built right in. And now, the innovations in Snow Leopard advance accessibility even further.

VoiceOver screen-reading built in.

Mac OS X is the first operating system to include as a standard feature an advanced screen-reading technology, which is called VoiceOver. Much more than simply a text-to-speech tool, VoiceOver makes it possible for those who are blind or have low vision to control their computer. It features a unique voice — based on speech technology invented by Apple — that delivers amazing intelligibility and natural intonation even at speaking rates up to 700 words per minute. And with Snow Leopard, VoiceOver gets more powerful and easier to use.

In addition, Mac OS X includes many other accessibility features such as dynamic full-screen magnification, plug-and-play braille display support, playback of closed captions, a scalable cursor, and more.

Learn more about Universal Access in Mac OS X ▸

Safari File Edit View History Bookmarks Window Help

Mon 10:50 AM

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THE INAUGURATION

PRESIDENT OBAMA VOWS ERA OF RESPONSIBILITY

◄ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 ►

Jae Hong/Associated Press

OPINION »

100 Days: J.F.K.'s Words

Kennedy's inaugural speech addressed a country that had been united by fear.

- Editorial: Obama's Pledge
  Comments (134)
- Brooks: Cohesion Politics
- Herbert: A Salute
- Op-Ed: Bush's Goodbye
- Opinionator: On the Blogs
- Freakonomics: White House Economist
- Op-Chart: First-Timers

"PRESIDENT OBAMA VOWS ERA OF RESPONSIBILITY"

The New York Times

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THE INAUGURATION

PRESIDENT OBAMA VOWS ERA OF RESPONSIBILITY

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Jae Hong/Associated Press

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- Op-Chart: First-Timers

Demo

VoiceOver

David Tseng
VoiceOver Quality Engineer

Accessibility Technology

VoiceOver and Your Application

Patti Hoa
VoiceOver Engineer

Agenda

- Apple’s accessibility efforts
- VoiceOver demo
- Accessibility technology
- How to audit and accessorize your application

Accessibility Technology Overview

- Assistive applications
- Accessibility hierarchy
- Accessibility information for a UI element
- How accessibility info is obtained
- NSAccessibility protocol

Assistive Applications

VoiceOver

Accessibility Inspector

Instruments

Automator
“Watch Me Do”

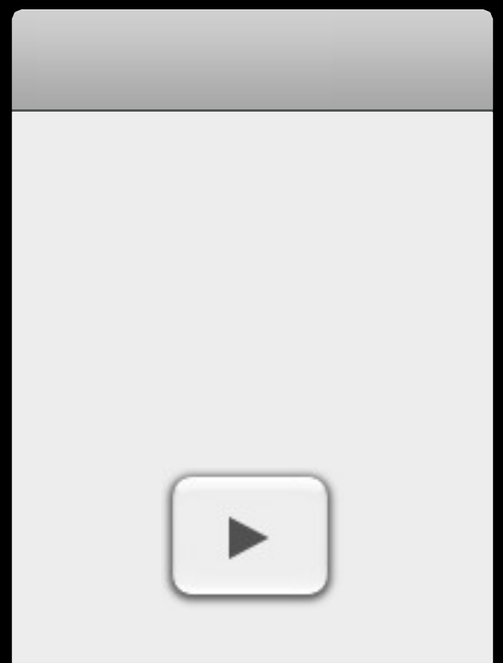
GUI Scripting

VoiceOver

How does VoiceOver access the interface in an application?

Graphical User Interface

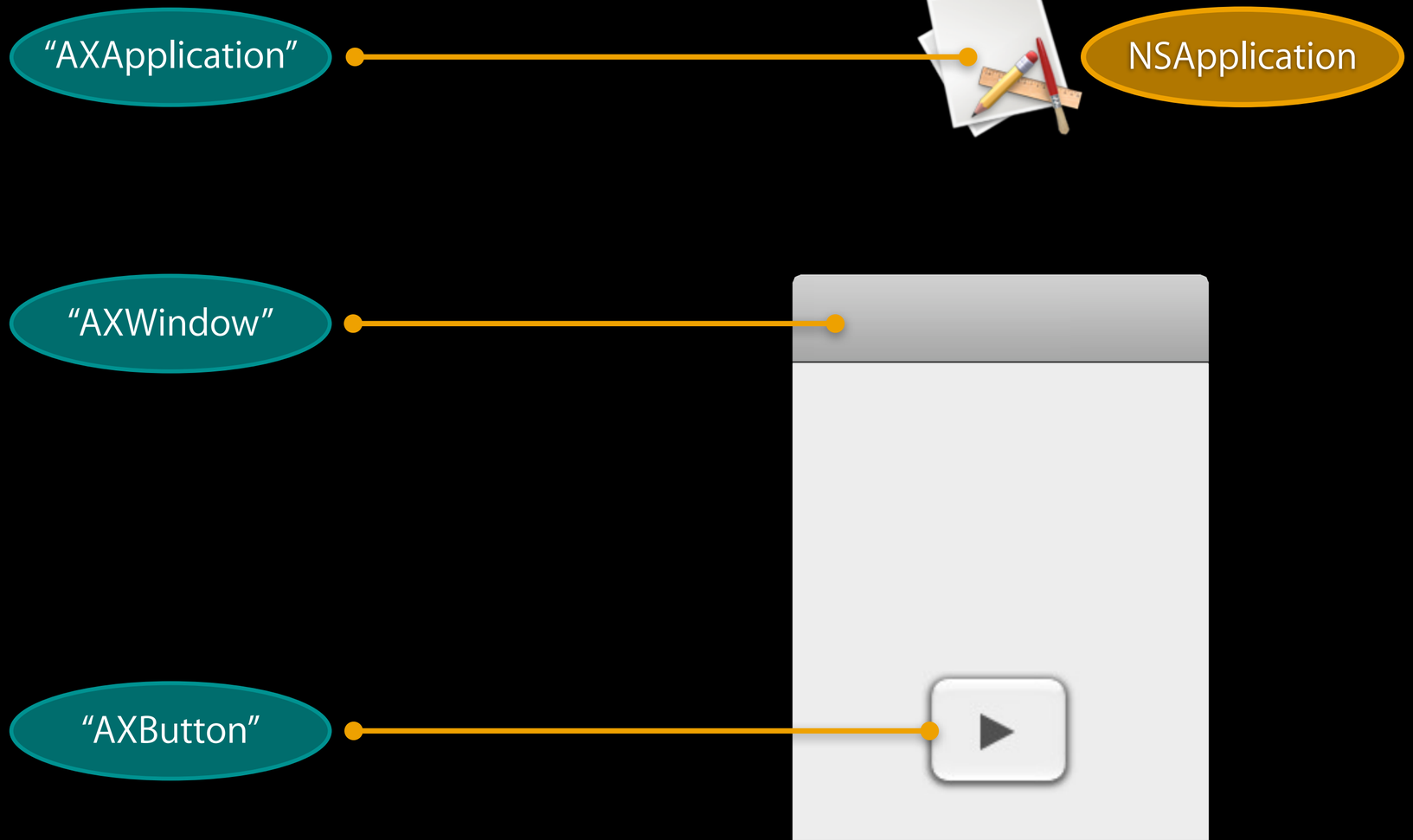
How VoiceOver accesses the interface



Alternate User Interface

How VoiceOver accesses the interface

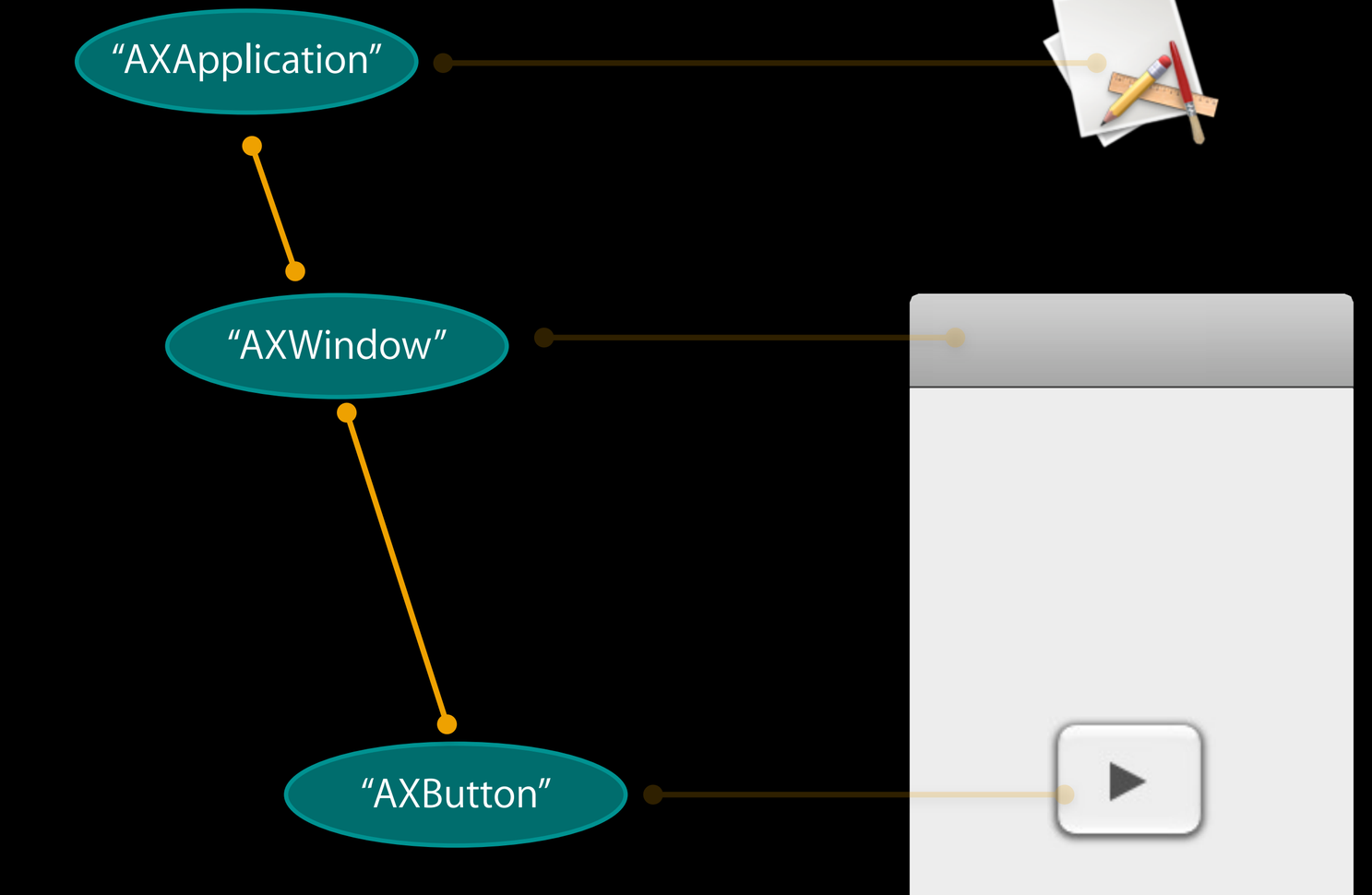
AXUIElementRef



Alternate User Interface

Parent-child hierarchy

AXUIElementRef

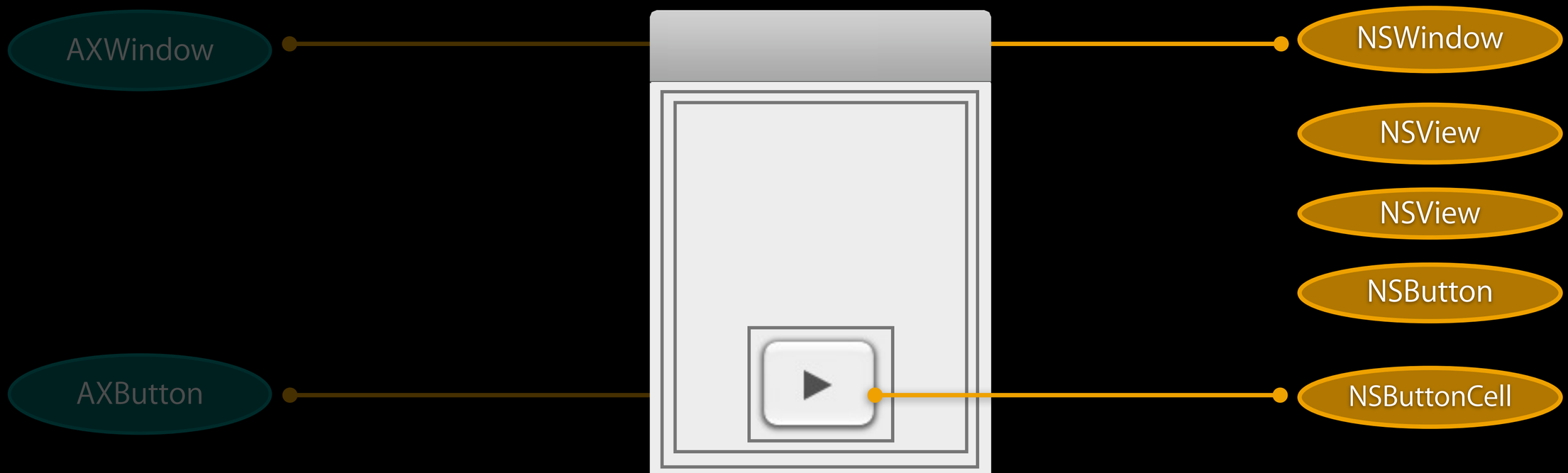


User Interface

Implementation from the Cocoa side

AXUIElementRef

Cocoa Object

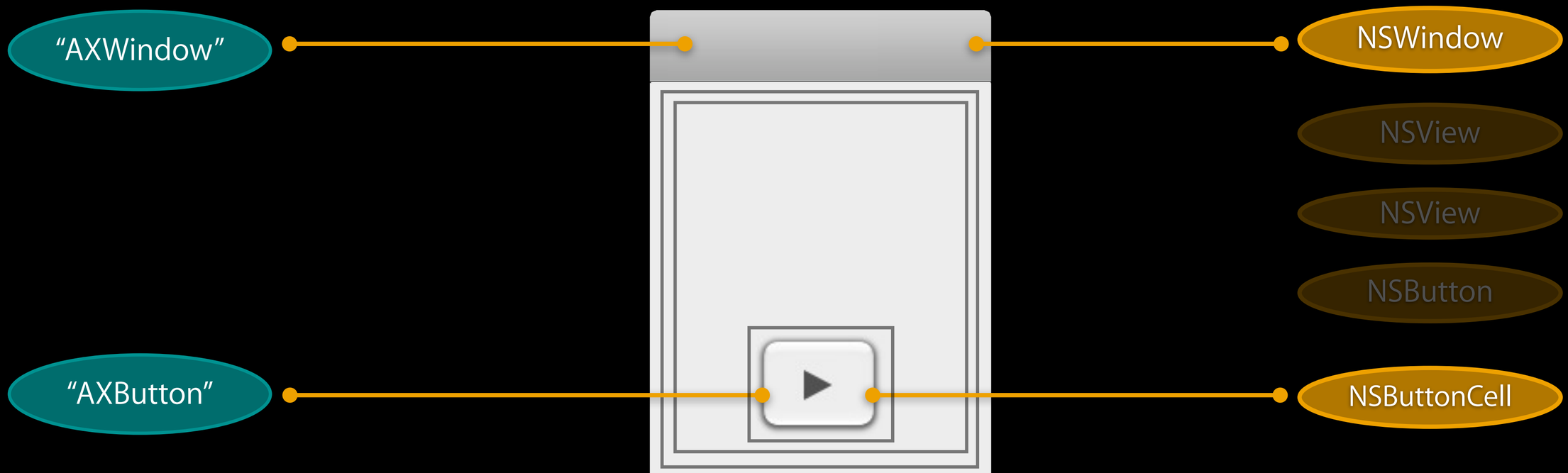


Alternate User Interface

One-to-one mapping

AXUIElementRef

Cocoa Object



Button AXUIElement Example

What VoiceOver knows about this UI element

Attribute Name	Attribute Value
AXRole	“AXButton”
AXRoleDescription	“button”
AXParent	window UI element
AXWindow	window UI element
AXTopLevelUIElement	window UI element
AXEnabled	“true”
AXFocused	“true”
AXDescription	“play”
AXHelp	NULL
AXPosition	(1084, 227)
AXSize	32 x 23
AXAction	AXPress

Button AXUIElement Example

What VoiceOver speaks

play button

Attribute Name	Attribute Value
AXRole	“AXButton”
AXRoleDescription	“button”
AXParent	window UI element
AXWindow	window UI element
AXTopLevelUIElement	window UI element
AXEnabled	“true”
AXFocused	“true”
AXDescription	“play”
AXPosition	(1084, 227)
AXSize	32 x 23
AXAction	AXPress

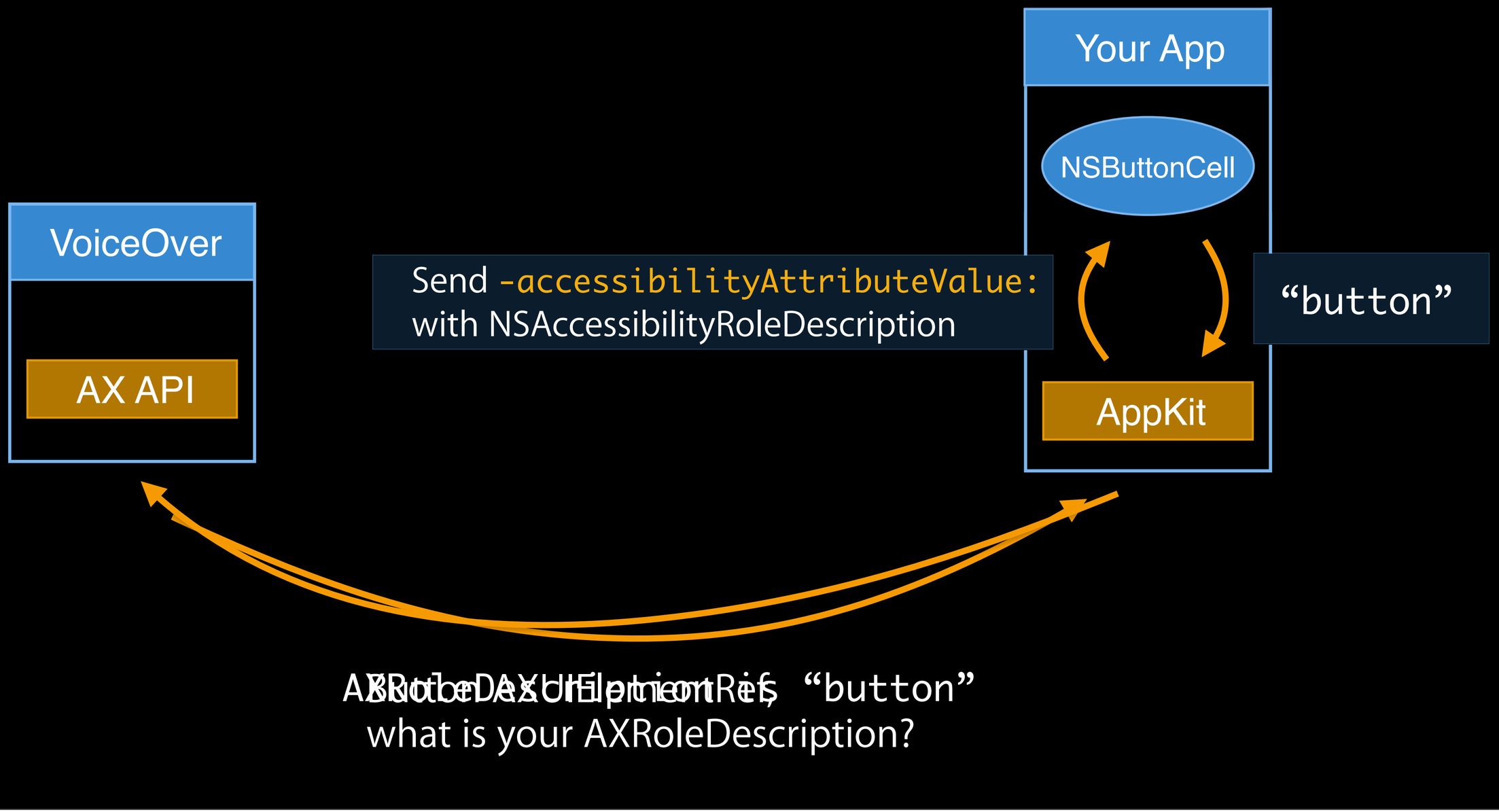
VoiceOver

How does VoiceOver interact with an application?

VoiceOver-Application Interaction

Processing the AXRoleDescription Request

How VoiceOver obtains the AXRoleDescription of a button



NSAccessibility Protocol

Getting and setting attributes

```
- (NSArray *)accessibilityAttributeNames;

- (id)accessibilityAttributeValue:(NSString *)attribute;

- (BOOL)accessibilityIsAttributeSettable:(NSString *)attribute;

- (void)accessibilitySetValue:(id)value forAttribute:(NSString *)attribute;
```

NSAccessibility Protocol

Getting parameterized attributes

- Used for complex UI elements like text

```
- (NSArray *)accessibilityParameterizedAttributeNames;

- (id)accessibilityAttributeValue:(NSString *)attribute
                     forParameter:(id)parameter;
```

NSAccessibility Protocol

Actions

```
- (NSArray *)accessibilityActionNames;

- (NSString *)accessibilityActionDescription:(NSString *)action;

- (void)accessibilityPerformAction:(NSString *)action;
```

Actions

Things that a UI element can perform

AXPressAction

AXIncrementAction
AXDecrementAction

AXConfirmAction
AXCancelAction

AXRaiseAction
AXShowMenuAction

NSAccessibility Protocol

Hit testing, focus testing, is ignored testing

```
- (id)accessibilityHitTest:(NSPoint)point;

- (id)accessibilityFocusedUIElement;

- (BOOL)accessibilityIsIgnored;
```

NSAccessibility Protocol

Notifications

- Broadcast important changes in state

  `AXFocusedUIElementChangedNotification`
  `AXValueChangedNotification`
  `AXUIElementDestroyedNotification`
  `AXWindowCreatedNotification`
  `others…`

- Mostly automatic

- An object sends using

```
NSAccessibilityPostNotification(id element, NSString *notification)
```

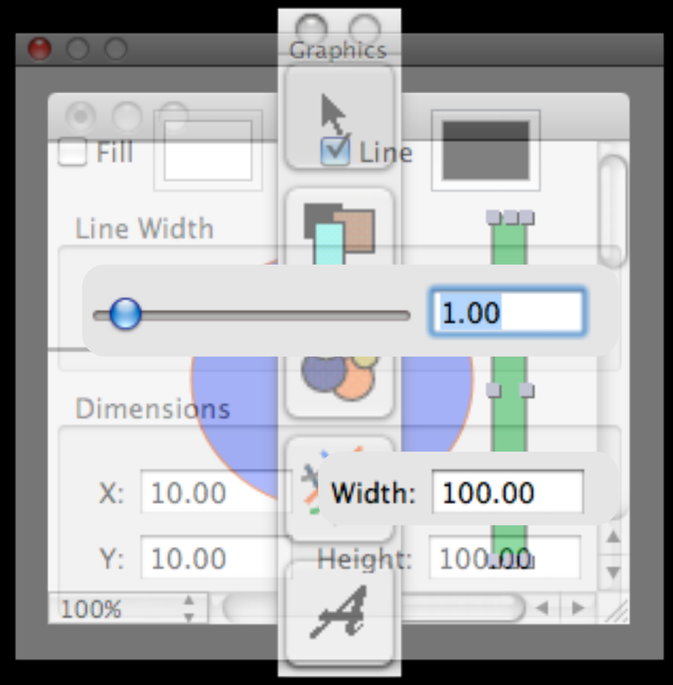
Demo

Auditing an application

Gregory Hughes, PhD
VoiceOver Engineer

Found Accessibility Issues

- Missing description for window
- Missing descriptions for buttons
- Lacking label for UI elements
- Uninformative VoiceOver output for slider
- Lacking full keyboard navigation
- Inaccessible canvas area



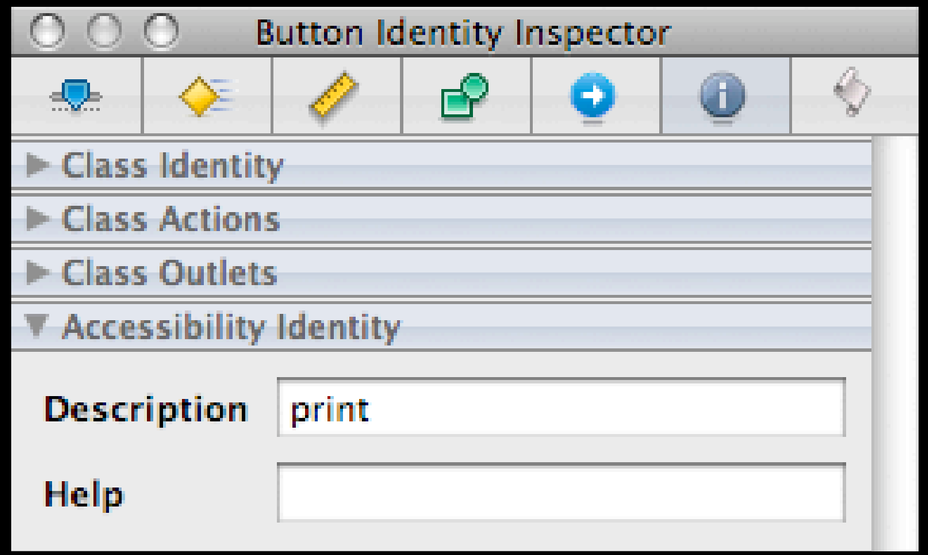
Advanced Accessibility: Best Practices and New APIs in Snow Leopard | Mission Friday 2:00PM

Instance Attribute—Description

- NSAccessibilityDescriptionAttribute
  - Localized string
  - Do not include the role
    - “Left align” not “left align button”
  - Often matches title, but all lowercase
  - Not to be confused with role description

Instance Attribute—Description

- NSAccessibilityDescriptionAttribute
  - Can set in Interface Builder



Instance Attribute—Description

- NSAccessibilityDescriptionAttribute
  - Can override the instance methods

```
- (NSArray *)accessibilityAttributeNames;
- (id)accessibilityAttributeValue:(NSString *)attribute;
```

  - Or, use the convenience method on an object instance

```
- (void)accessibilitySetOverrideValue:(id)value
                         forAttribute:(NSString *)attribute
```

    - *Not for dynamic values*
    - *Only for description, help, title UI element and linked UI element*

Found Accessibility Issues

- Missing description for window
- Missing descriptions for buttons
- Lacking label for UI elements
- Uninformative VoiceOver output for slider
- Lacking full keyboard navigation

NSImage Accessibility Description

- Set an accessibility description on an image

```
NSImage *image = [NSImage imageNamed:"Circle"];
NSString *desc = NSLocalizedString(@"circle tool", @"image desc");

[image setAccessibilityDescription:desc];
```

- Elements that display images use the description if present
  - NSImageCell
  - NSButtonCell
  - NSSegmentedCell

Strings File Support

Automatic lookup of image description

New

Circle.tiff

```
NSImage *image = [NSImage imageNamed:"Circle"];
```

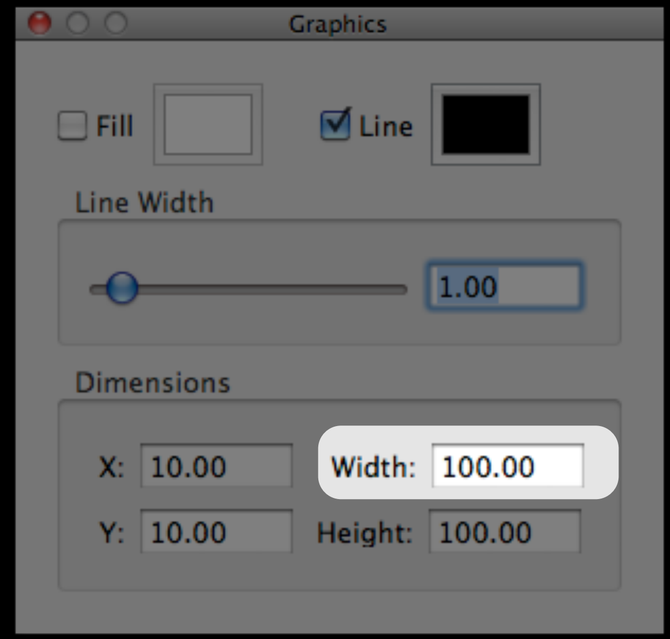
AccessibilityImageDescriptions.strings

```
"Circle" = "circle tool";
```

```
AXDescription = "circle tool"
```

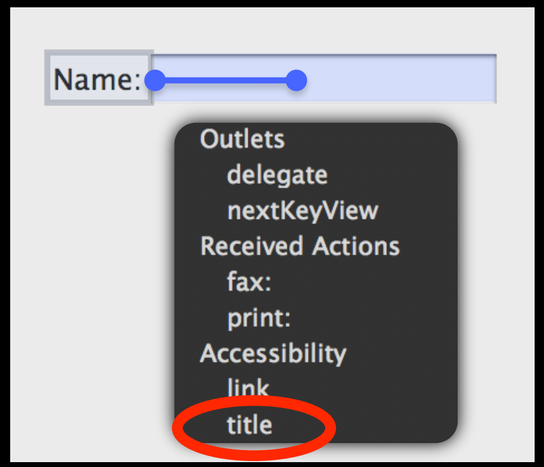
Found Accessibility Issues

- Missing description for window
- Missing descriptions for buttons
- Lacking label for UI elements
- Uninformative VoiceOver output for slider
- Lacking full keyboard navigation



Instance Attribute—Title UI Element

- NSAccessibilityTitleUIElementAttribute
  - Easiest to set in Interface Builder



Instance Attribute—Title UI Element

- NSAccessibilityTitleUIElementAttribute
  - Can override the instance methods

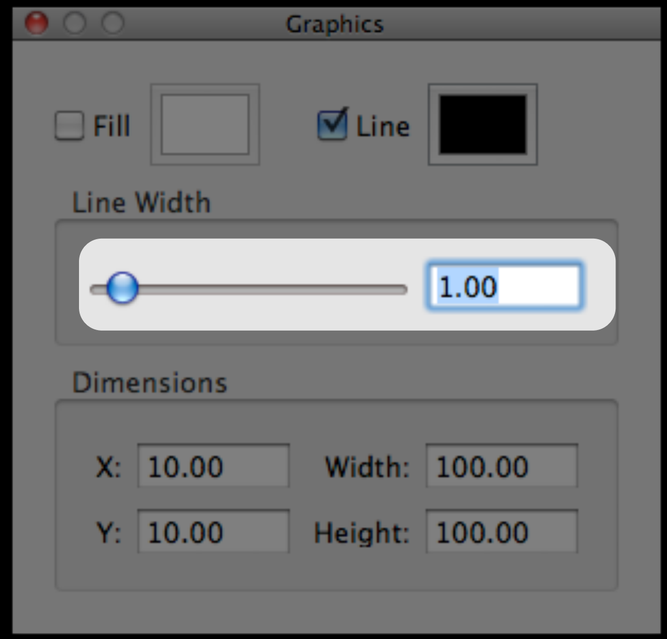
```
- (NSArray *)accessibilityAttributeNames;
- (id)accessibilityAttributeValue:(NSString *)attribute;
```

  - Or, use the convenience method on an object instance

```
- (void)accessibilitySetOverrideValue:(id)value
                         forAttribute:(NSString *)attribute
```

Found Accessibility Issues

- Missing description for window
- Missing descriptions for buttons
- Lacking label for UI elements
- Uninformative VoiceOver output for slider
- Lacking full keyboard navigation



Instance Attribute—Value Description

- NSAccessibilityValueDescriptionAttribute
  - Override the instance method

```
- (id)accessibilityAttributeValue:(NSString *)attribute;
```

  - Don’t forget to also override

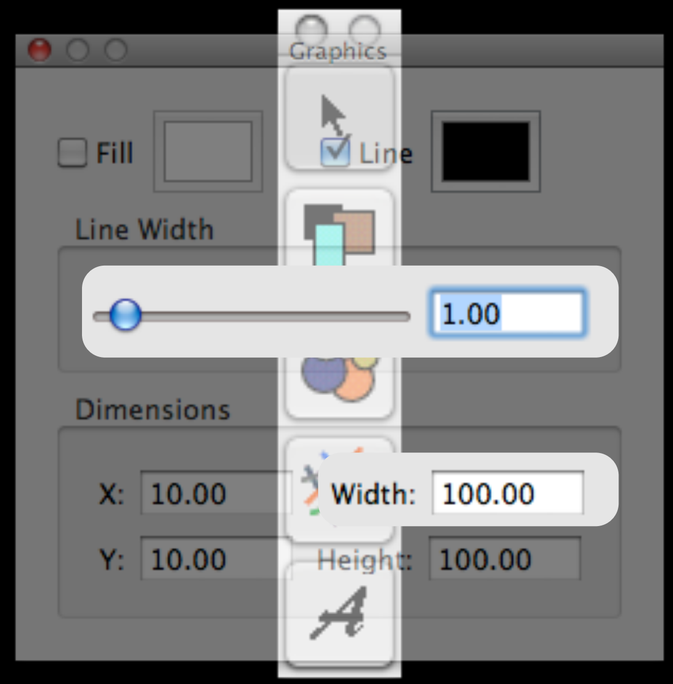
```
- (NSArray *)accessibilityAttributeNames;
```

Found Accessibility Issues

- Missing description for window
- Missing descriptions for buttons
- Lacking label for UI elements
- Uninformative VoiceOver output for slider
- Lacking full keyboard navigation

Fixing Accessibility Issues in Sketch

- Missing description for window
  - Set override for description attribute
- Missing descriptions for buttons
  - AccessibilityImageDescriptions.strings
- Lacking label for UI elements
  - Link title elements in Interface Builder
- Uninformative VoiceOver output for slider
  - Subclass NSSliderCell and implement




```
- (NSArray *)accessibilityAttributeNames;
- (id)accessibilityAttributeValue:(NSString *)attribute;
```

Demo

Accessorizing an application

Final Thoughts

- Application accessibility affects your users and you
- Audit your application for accessibility needs
- Use Cocoa accessibility API and Interface Builder

More Information

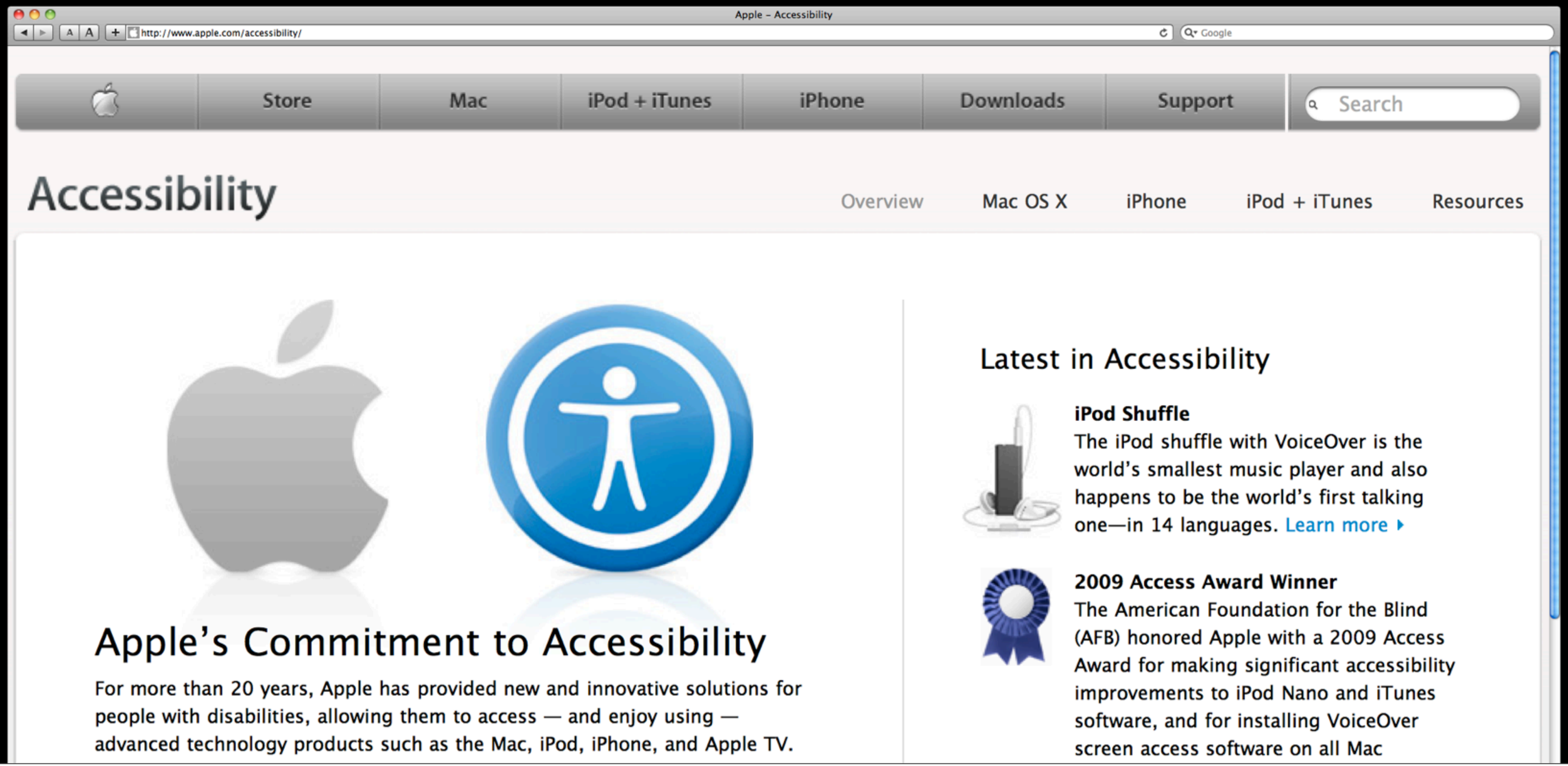
Eric Hope
Application Technologies Evangelist
ehope@apple.com

Accessibility Mailing List
Public developer list
accessibility-dev@lists.apple.com

Documentation
Mac OS X User Experience—Accessibility
http://developer.apple.com/ue/accessibility

Accessibility Webpage

www.apple.com/accessibility



Related Sessions

Advanced Accessibility: Best Practices and New APIs in Snow Leopard	Mission Friday 2:00PM
iPhone Accessibility: Make Your App Compatible with VoiceOver	North Beach Thursday 9:00AM
Improving Accessibility in Web Applications	Russian Hill Friday 9:00AM

Labs

Mac OS X Accessibility Lab	OS X Lab A Thursday 2:00PM
Mac OS X Accessibility Lab	OS X Lab D Friday 2:00PM

Q&A

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